

AMENDMENT UNDER 37 C.F.R. § 1.116

Application No.: 10/067,266

Atty Docket No.: Q63212

REMARKS

Claims 1, 3, 5 to 11, 13 to 16, 18, 20 and 21 are all the claims pending in the application, upon entry of the present amendment.

Claims 1-3, 5-18, 20 and 21 have been rejected under 35 U.S.C. § 103(a) as obvious over WO 00/58536 to Nishimura et al, whose English equivalent is U.S. Patent 6,489,026, in view of EP '062 to Harada et al.

Applicants submit that the Nishimura et al do not disclose or render obvious the subject of claims 1, 3, 5 to 11, 13 to 16, 18, 20 and 21 and, accordingly, request withdrawal of this rejection.

The present invention as set forth in claim 1 as amended above is directed to an electrical insulating vapor grown carbon fiber having a fiber diameter of 0.01 to 0.5 μm , a hollow part in the center of the fiber and a boron concentration of about 1 to about 30% by mass in terms of a boron element, wherein the surface thereof is partially or entirely coated with an electrical insulating material of boron nitride and the amount of boron in a depth of 1 nm from the surface of the vapor grown carbon fiber is about 10% by mass or more, based on the entire mass of the vapor grown fiber having a depth of 1 nm from the surface, and wherein the electrical insulating vapor grown carbon fiber has a specific resistivity of $10^3 \Omega\cdot\text{cm}$ or more when compressed at a bulk density of 0.8 g/cm^3 .

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Thus, applicants have amended claim 1 to recite that the electrical insulating material is boron nitride, and that the amount the electrical insulating vapor grown carbon fiber has a specific resistivity of $10^3 \Omega\text{-cm}$ or more when compressed at a bulk density of 0.8 g/cm^3 . Applicants have amended independent claims 11 and 16 in a similar manner. In view of these amendments, applicants have canceled claims 2, 12 and 17, and have amended claims 5, 15 and 20 to delete reference to the specific resistivity. In addition, applicants have amended claims 3, 13, 14 and 18 to change their dependency so that they do not depend from a canceled claim.

Further, applicants have amended claims 6 and 7 to make it clear that a boron nitride electrical insulating material is formed. Thus, for example, the present invention as set forth in claim 6 is directed to a method for producing an electrical insulating vapor grown carbon fiber, comprising mixing a boron compound with a vapor grown carbon fiber having a fiber diameter of 0.01 to $0.5 \mu\text{m}$ to form a mixture and heat-treating the mixture at $2,000^\circ\text{C}$ or more in the presence of a nitrogen compound to form a boron nitride electrical insulating material

The Examiner relies on Nishimura et al as the primary reference for all of the claims, and relies on Harada et al for claims 6 to 8 for its teaching of the use of a nitrogen compound during heat treating at a temperature of 2000°C or more.

A distinguishing feature of the present invention is that the electrical insulating material is boron nitride. Thus, as can be seen in Table 1 at page 15 of the present application, Comparative Example 2 of the present application, which employed argon as the inert gas, and

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which did not form boron nitride, had a resistivity of $0.005 \Omega\text{-cm}$, whereas Example 1, which employed nitrogen as the inert gas and formed boron nitride, had a resistivity of $1 \times 10^4 \Omega\text{-cm}$. Independent claims 1, 6, 7, 11 and 16, now recite the use of boron nitride as the electrical insulating material. Nishimura et al do not disclose an electrical insulating material of boron nitride.

Further, applicants point out that Table 2 at columns 14 and 15 of Nishimura et al disclose the “powder resistances” of the boron-containing carbon fibers produced in an argon atmosphere in Examples 4 and 5 of Nishimura et al. The powder resistance values in Table 2 of Nishimura et al for the boron-containing fibers are from 0.002 to 0.003 $\Omega\text{-cm}$, and appear to be similar to the resistivity of Comparative Example 2 of the present application, and not in accordance with the requirements of claims 1, 11 and 16.

In the Office Action, the Examiner states that with respect to the specific resistivity values, which had been set forth in claims 5, 15 and 20 and now appear in claims 1, 11 and 16, that since Nishimura et al teach a vapor grown carbon fiber having a boron concentration within applicants’ range and formed in a manner substantially as contemplated by applicants, it is the Examiner’s position that this property is the same as and is inherent in the fibers of Nishimura et al.

Applicants submit that Table 2 of Nishimura et al disproves the Examiner’s position that Nishimura et al obtain the specific resistivity that is set forth in the present claims. Thus, the

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powder resistance in Table 2 of Nishimura et al of 0.002 to 0.003 Ω•cm does not satisfy the recitation of the present claims of a specific resistivity of 1×10^3 Ω•cm or more.

Since Nishimura et al do not disclose the resistivity that is set forth in the present claims 1, 11 and 16, applicants submit that these claims, and the claims dependent therefrom, are patentable over Nishimura et al.

Claims 6 and 7 recite that heat treating is performed in the presence of a nitrogen compound to form a boron nitride. This nitrogen compound is different from the boron compound that is mixed with the vapor grown carbon fiber. Claims 8 recites that the nitrogen compound is nitrogen.

The Harada et al patent that the Examiner has cited employs an inert gas such as argon, helium, or nitrogen for the graphitization, but does not disclose the use of a boron compound or that nitrogen is employed for the purpose of forming boron nitride. In each of the Examples of Harada et al, only argon was employed and boron nitride was not formed. Claims 6 and 7 specifically recite that the nitrogen compound forms boron nitride as an electrical insulating material. Accordingly, applicants submit that claims 6 and 7, and the claims dependent thereon, clearly distinguish over Nishimura et al and Harada et al.

In view of the above, applicants submit that the subject matter of claims 1, 3, 5 to 11, 13 to 16, 18, 20 and 21 is not disclosed or suggested by Nishimura et al and Harada et al and, accordingly, request withdrawal of this rejection.

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In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

Sheldon I. Landsman

Sheldon I. Landsman

Registration No. 25,430

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

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